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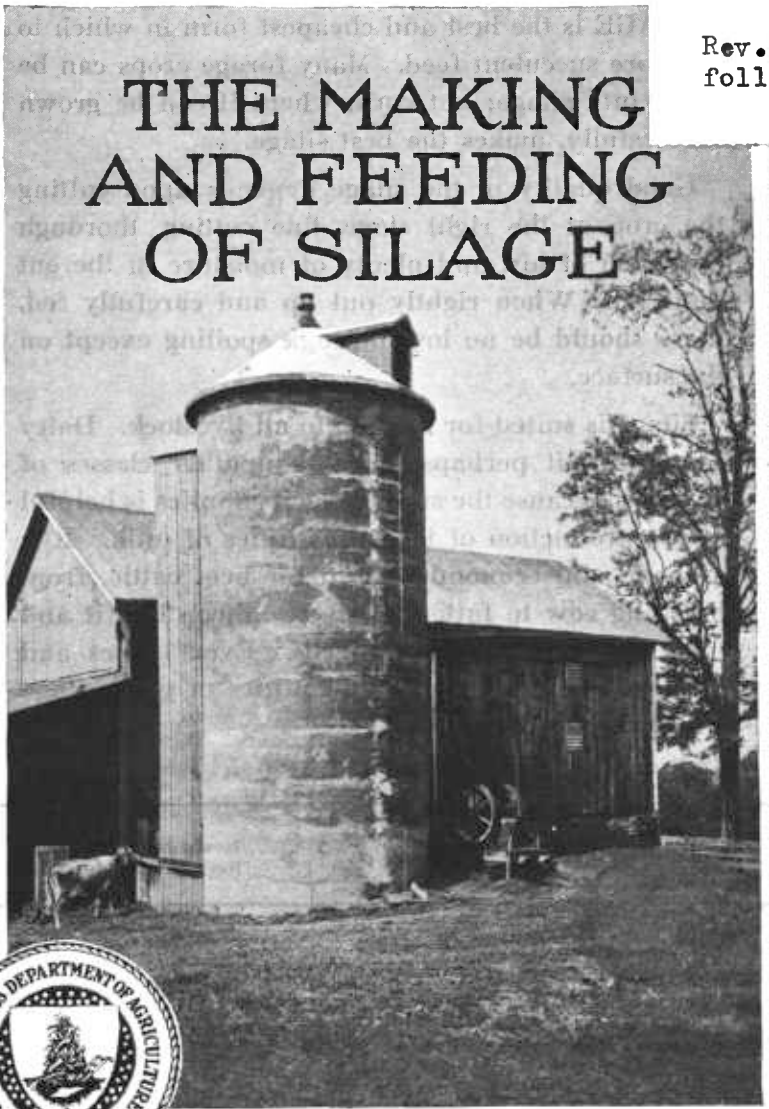
THE MAKING AND FEEDING OF SILAGE



SILAGE is the best and cheapest form in which to store succulent feed. Many forage crops can be made into silage; but corn, where it can be grown successfully, makes the best silage.

Good quality in the silage depends upon cutting the crop at the right stage, fine cutting, thorough exclusion of air, and plenty of moisture in the cut material. When rightly put up and carefully fed, there should be no loss through spoiling except on the surface.

Silage is suited for feeding to all livestock. Dairy cows need it perhaps more than other classes of animals, because the succulence it supplies is helpful in the production of large quantities of milk. It is a cheap and economical feed for beef cattle, from breeding cow to fattening steer. Sheep like it and it is well suited to their needs. Even horses and mules may be fed limited quantities of good silage with good results.

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THE MAKING AND FEEDING OF SILAGE

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MANUFACTURE AND FEEDING VALUE OF SILAGE

By T. E. WOODWARD and J. B. MCNULTY

SILAGE is feed that has been cut and packed in an air-tight container or pit, with moisture enough to allow a partial fermentation, which preserves it in a slightly sour condition.

Dairymen and feeders of cattle have long appreciated the value for milk and meat production of the succulent pasture grasses which are so abundant in the spring and summer. To obtain succulence in the winter or when pasture is not available, forage crops are made into silage.

Silage has certain laxative properties which keep the digestive organs of animals in good condition. Livestock receiving some form of succulent feed have keener appetites, softer and more pliable skins, and a more thrifty, more healthy appearance than those fed exclusively on dry rations.

LOSSES OF FOOD NUTRIENTS IN THE SILO

When a crop is placed in the silo the temperature of the material rises in a few days to about blood heat and then gradually diminishes. The sugars are converted to acids, mainly lactic and acetic, which give the silage a sour taste and help to preserve it by inhibiting the

[1] Mr. McNulty resigned from the department Aug. 26, 1919, and Mr. Rommel Oct. 31, 1921.

growth of certain organisms. Normal corn silage contains about 1.5 per cent of acid.

Losses of food nutrients are due to two causes—contact with air and fermentation. The air may be excluded from the silo by proper packing of the material, by air-tight construction, and by careful attention to sealing cracks around the doors. The top of the silage is necessarily exposed to the air and will spoil, but this is the only spoiling due to air which can not be avoided. In a silo 14 feet in diameter the amount of spoiled silage on the top will be 1½ or 2 tons three months after filling.

Losses due to fermentation can not be avoided. According to the Missouri Agricultural Experiment Station [2] these losses of dry matter for various crops are as follows: Corn, 4.01 per cent; grass crops, 18.06 per cent; peas and oats, 6.90 per cent; and legume crops, 2.12 per cent.

CROPS SUITABLE FOR SILAGE

By the exercise of proper methods almost any green crop can be made into silage successfully. Considerable care must be taken, however, to expel the air from such hollow-stemmed plants as the small cereal grains by cutting fine and packing firmly. Other crops, legumes for example, are deficient in the fermentable constitutents so desirable in the production of silage that is palatable and possesses good keeping qualities. On the other hand, a few crops, such as the sorgos, have so much sugar that unless cut at a more mature stage they have a tendency to produce a silage that is too sour.

CORN

Corn is the common silage crop wherever it can be grown successfully. (Fig. 1.) Silage made from corn has a good flavor, is very palatable, and will keep in good condition for years. It contains nearly as high a percentage of digestible nutrients as the corn from which it was made. When it is properly siloed, the losses of digestible nutrients from fermentation are smaller than in most other crops.

Over a considerable portion of the United States more food material can be obtained from an acre of corn as silage than from an acre of any other crop. Corn is more easily harvested and put into the silo than crops like rye, clover, cowpeas, or alfalfa, and when cut for silage the maximum quantity of nutrients is preserved. Experiments have shown that corn, when siloed, loses 4.01 per cent of the dry matter against 15.12 per cent when cut for fodder and cured in the field.[3] Moreover, there is less waste in feeding silage than in feeding fodder, since good silage properly fed is practically all consumed. When corn is cut for silage the land is cleared and left ready for another crop sooner than when the corn is shocked or is husked from the standing stalk. Corn can be put into the silo at a cost not above that of shocking, husking, grinding, and shredding.

In spite of the many strong points in favor of corn as a silage crop, however, it is not a perfect ration, because it is low in both pro-

[2] RAGSDALE, A. C., and TURNER, C. W. SILAGE INVESTIGATIONS—LOSS OF NUTRIENTS IN THE SILO AND DURING THE FIELD CURING OF CORN. Missouri Agr. Expt. Sta. Research Bul. 65, 10 p. 1924.

[3] RAGSDALE, A. C., and TURNER, C. W. Op. cit.

tein and mineral matter. In filling the silo, clover, cowpeas, soy beans, or alfalfa is sometimes mixed with corn in order to correct the deficiency of protein. Ordinarily this is not to be advised if the legumes can be made into a good quality of hay.

VARIETIES TO PLANT

As there is a steady increase in all nutrients of a corn crop up to maturity, it is best to plant a variety of corn that will mature sufficiently for silage before frost. Since the corn does not need to be so mature for silage as for grain, it is possible to use a later maturing variety and thus obtain a greater yield than would be obtained from the varieties ordinarily planted for grain. At the Ohio experiment station it was found [4] that early maturing corn yielded 10.31 tons

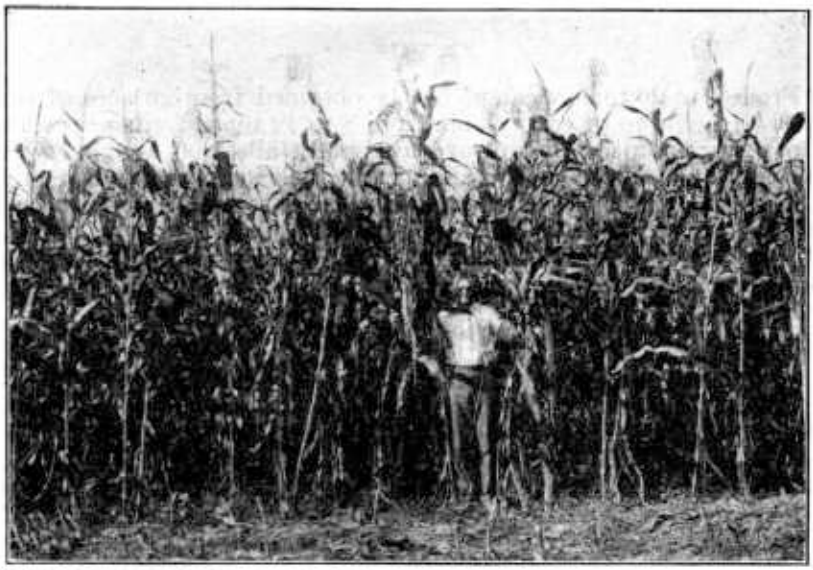

FIG. 1.—Well-eared corn makes silage of the best quality

of silage per acre whereas late maturing corn yielded 11.97 tons. There appears to be little if any advantage in using a variety which produces foliage and stalk at the expense of grain as the ears contain the most valuable part of the food constituents. Ordinarily the variety of corn which produces the most grain to the acre is the best to use for silage. The greater the quantity of grain in the silage the more nutritious the silage and the greater the saving of concentrated feed used to supplement the silage.

METHODS OF PLANTING

Work at the Illinois experiment station [5] shows that thick planting results in greater tonnage and in more stalk and foliage in propor-

[4] HAYDEN, C. C. "SILAGE CORN" OR "FIELD CORN" FOR SILAGE? Ohio Agr. Expt. Sta. Mo. Bul. 8: 145–148. 1923.

[5] MORROW, G. E., and HUNT, T. F. FIELD EXPERIMENTS WITH CORN, 1890. Ill. Agr. Expt. Sta. Bul. 13: [389]–432, illus. 1891.

tion to the ears than does thin planting. When the corn is planted less than about 12 inches apart in rows 40 to 44 inches apart on good land, the total yield of ears is decreased and the proportion of poor ears to good ears is increased. Planting more than about 12 inches apart on good land increases the proportion of good to poor ears but decreases the total weight of ears. It is thought best to space the planting so as to obtain the greatest total yield of ears. On good land this will be about 12 inches; on poorer land possibly as much as 18 inches. On weedy land it is better to plant in hills so that the corn can be cultivated both ways, in which case the planting may vary from two or three kernels in a hill to three or four kernels, depending upon the fertility of the soil. The growth of weeds lowers the yield of corn, but unless weeds are present in great numbers they do not noticeably affect the quality of the silage and therefore can be cut along with the corn and put into the silo.

YIELD

From 4 to 20 tons of silage can be obtained from an acre of corn. A 50-bushel crop of corn yields from 8 to 12 tons of silage per acre, depending upon the amount of leaves and stalks that accompany the ears and upon the stage of maturity at which it is siloed. The quantity of silage that may be expected per acre is often roughly estimated at 1 ton for each 5 or 5½ bushels of shelled corn. Southern varieties of corn as a rule have a larger proportion of stalks and leaves than northern-grown varieties.

TIME TO HARVEST

Ordinarily corn should be harvested for the silo about a week or 10 days before it would be cut for shocking—that is, when about 90 per cent of the kernels are dented and at least 75 per cent of the kernels are hardened so that no milk can be squeezed out. At this time the lower leaves on the stalk are turning brown and the green corn fodder contains 65 to 70 per cent of moisture, which is sufficient for silage. Silage made from corn containing moisture enough for proper preservation is more palatable than that made from corn so mature as to require the addition of water.

Table 1 (taken from the Eighth Annual Report of the New York State Agricultural Experiment Station)[6] shows the steady increase in the yield of food nutrients per acre up to the time the corn is ripe. For this reason the corn plant should be allowed to mature as much as possible and still have moisture enough to pack the corn properly in the silo without the addition of water. Probably the moisture content should not fall below 65 per cent or exceed 75 per cent. Of course, when a large quantity of silage is made and weather conditions are favorable the moisture content can not be kept within these limits.

[6] LADD, E. F. REPORT OF THE CHEMIST. N. Y. State Agr. Expt. Sta. Ann. Rpt. (1889) 8: [71]–214. 1890.

TABLE 1.—*Chemical changes during growth of corn plant*

Yield per acre	Stage of growth				
	Tasseled, July 30	Silked, Aug. 9	Milk, Aug. 21	Glazed, Sept. 7	Ripe, Sept. 23
Total yield	*Pounds* 18,045.00	*Pounds* 25,745.00	*Pounds* 32,600.00	*Pounds* 32,295.00	*Pounds* 28,460.00
Water	16,426.00	22,666.00	27,957.00	25,093.00	20,542.00
Dry matter	1,619.00	3,078.00	4,643.00	7,202.00	7,918.00
Ash	138.91	201.30	232.15	302.48	364.23
Albuminoids	239.77	436.76	478.69	643.86	677.78
Crude fiber	514.19	872.93	1,261.97	1,755.85	1,734.04
Nitrogen-free extract	653.91	1,399.26	2,441.29	4,239.82	4,827.60
Fat	72.20	167.75	228.90	259.99	314.34

IMMATURE AND FROSTED CORN

When weather conditions such as hail, drought, or frost prevent the maturing of corn for the silo, it may be cut while still immature and produce a fair grade of silage. A good practice is to mix such corn with some which is more mature. Silage from immature corn will be more sour than usual and more laxative when fed in large quantities, a trouble that can be avoided by care in feeding.

Frosted corn dries out very quickly and many leaves are lost in handling. The corn may be so dry, also, that it will not pack well, which necessitates the addition of considerable water at the time of filling. Frosted corn should be cut as soon as possible, in order to prevent excessive drying out. If this is done the stalks may contain sufficient moisture for satisfactory silage without the addition of water. The frosting of the corn causes only a small decrease in feeding value, the greater part being due to the loss of leaves in handling.

DRY CORN FODDER

Sometimes there is a delay in filling the silo and it is necessary to cut and shock the corn; also, on farms which have a limited silo capacity, it is often desired to refill the silos after the silage has been fed out. Dry corn fodder may be siloed successfully, but it is absolutely necessary that water enough be added to make it pack well in the silo. Water may be added by allowing a stream from a hose to flow into the blower or the top of the blower pipe while filling. In addition, it is desirable to sprinkle the surface of the cut material as it is distributed in the silo. Corn-fodder silage is not so palatable nor so good as silage made when the corn is at the proper stage. It also lacks the aroma of good corn silage. The Missouri station reports that the water to be added should be of the same weight as the corn fodder.[7] Owing to the large quantity of water required, siloing corn fodder is advisable only on farms having a water system.

[7] ECKLES, C. H. SHOCK CORN FOR SILAGE. Missouri Agr. Expt. Sta. Circ. 71, p. 25–28, illus. 1914.

Corn stover likewise can be made into silage by the same method. It lacks flavor and palatability and is low in feeding value. It is doubtful whether the making of such silage is an economical practice.

SORGHUMS

The sorgos (saccharine sorghums), such as Amber cane and Orange cane, and nonsaccharine sorghums, such as Kafir, feterita, milo, Japanese cane, Napier grass, and Sudan grass, are all suitable for silage. Sorghums are more dependable and yield more in those regions of the South and West where the rainfall is too light or irregular or the soil too poor for a good growth of corn. For successful silage it is important that the saccharine sorghums be harvested when the seed has become hard. If harvested earlier, a silage with a high acid content is produced. Experiments in Kansas[8] and California[9] indicate that there is little difference in feeding value between sorghum and corn silage. A mixture of corn and sorghum has proved to be satisfactory in some localities where the rainfall is so variable as to make the corn crop uncertain.

FIG. 2.—Shock corn, if properly handled, will make fair silage

LEGUMES

The legumes include the clovers, alfalfa, cowpeas, soy beans, velvet beans, and vetches. All of these may be made into a good quality of silage under proper conditions. It is ordinarily a better practice, however, to make them into hay provided weather conditions permit proper curing. A crop can be preserved more cheaply as hay than as silage because of the lesser weight of water which must be handled and because of the lack of

[8] REED, O. E., and FITCH, J. B. SORGHUM CROPS FOR SILAGE. FEEDING EXPERIMENTS WITH DAIRY CATTLE. Kans. Agr. Expt. Sta. Circ. 28, 6 p. [1913.]

[9] WOLL, F. W., and VOORHIES, E. C. TRIALS WITH CALIFORNIA SILAGE CROPS FOR DAIRY COWS. Calif. Agr. Expt. Sta. Bul. 282, p. [19]–40. 1917.

machinery adapted to the easy handling of broadcast crops in the green state. It is possible also that properly cured hay contains valuable vitamins that would be destroyed if the crop were put in the silo.

Legumes have a low content of sugar from which the acids so helpful in the preservation of silage are developed. For this reason greater precautions must be exercised in the making of legume silage than are necessary with the nonleguminous crops. All the legumes may be siloed successfully if mixed with a crop containing much sugar, such as corn or the sorghums; or they may be siloed alone provided the moisture content of the material is sufficiently low. When all conditions are favorable the resulting silage is palatable and the losses of food nutrients probably no greater than with corn.

At the Kansas experiment station [10] alfalfa was made into silage successfully by the addition of blackstrap molasses at the rate of 4 or 5 per cent by weight. The molasses was said to improve both the palatability and the keeping quality of the silage. At the Missouri experiment station [11] alfalfa made good silage when the moisture content of the crop ranged between 50 and 70 per cent as a result of either allowing the crop to mature sufficiently or partially drying it in the field for a few hours after mowing. On the other hand a greater moisture content resulted in ill-smelling, unpalatable silage and a considerable loss of food nutrients. Except during a period of low rainfall alfalfa at the haymaking stage usually contains too much moisture to make good silage.

The Missouri station also reports that the clovers, soy beans, and cowpeas may be made into good silage provided the moisture content is not too high. Clover for silage should be allowed to become somewhat more mature than when cut for hay. Soy beans and cowpeas should reach the stage when the seeds are well developed and the pods are beginning to turn yellow. If they have not reached this stage they should be allowed to lie in the field until thoroughly wilted.

While cowpeas and soy beans may be siloed separately, a more general practice is to use them in combination with corn or sorghum. They are grown either in separate fields or with the corn. When grown with corn cowpeas climb the stalks and make harvesting difficult. Soy beans, being self-supporting, can be harvested readily with the corn by means of a corn binder. For this reason and because they can be planted earlier in the season, soy beans make a more satisfactory crop to grow with the corn.

A strong odor is imparted to milk if legume silage is fed to cows immediately before they are milked. It is therefore advisable to feed legume silage either immediately after milking or several hours before.

SMALL GRAINS

When small grains, such as wheat, barley, buckwheat, rye, and oats, are used for silage they should be cut when the kernel is just passing from the milk into the dough stage. It is very important

[10] REED, O. E. LATE SILAGE INVESTIGATIONS. Hoard's Dairyman 53: 322, 350, illus. 1917.

[11] ECKLES, C. H. LEGUMES, SUDAN GRASS, AND CEREAL CROPS FOR SILAGE. Missouri Agr. Expt. Sta. Bul. 162, 25 p. 1919.

to cut them fine and pack them firmly in the silo. The small grains ordinarily make more palatable silage than the legumes, but are inferior to either corn or sorghum. Because of the early stage at which they must be cut and the normal loss from fermentation, there is a marked loss in digestible nutrients in silage made from small grains as compared to maturing them for grain. It is usually advisable, therefore, to harvest them for grain. Only when corn or sorghum can not be grown successfully and the need of succulent feed is great is it desirable to cut small grains for silage.

Of these crops rye especially makes a rather unpalatable silage which must be fed with care to avoid tainting the milk.

FIELD PEAS AND OATS, OR VETCH AND WHEAT

Field peas and oats or vetch and wheat planted together make a palatable silage high in protein and are particularly adapted to sections of the United States where the climate makes the growing of corn or sorghum uncertain or impossible. The best time to cut oats and peas for silage is when the oats are in the late dough stage or showing first signs of turning yellow and the pea pods are turning slightly yellow. At this time the crop contains 30 to 40 per cent of moisture, which is the essential condition to success. If cut earlier the crop should be allowed to dry to some extent before it is placed in the silo. Probably wheat and vetch should be harvested at a similar stage of maturity. Fine cutting and thorough packing are necessary when peas and oats or wheat and vetch are siloed together.

MILLET

The millets are not generally used as silage crops, although those who have had experience with them say that a fair grade of silage can be made if the crop is cut when nearly ripe enough for seed. It should be cut fine and packed firmly in the silo. As a rule, however, the millets are probably more profitable when used as soiling crops or as hays.

PEA VINES

Pea vines from canning factories are used for silage. In feeding value they are about equal to corn silage, being a little richer in protein, but containing about the same quantity of total digestible nutrients. Frequently pea vines are stacked instead of being put into the silo, in which case considerable loss occurs, especially if the stack is opened in warm weather. Stacked pea vines should not be used until cold weather or until such time as the silage can be fed continuously. Pea-vine silage is rather laxative and should always be fed with care. Because of its strong odor it should always be fed after milking.

BEET TOPS

If properly handled, beet tops and crowns can be made into good silage. The tops should be run through the cutter and put into the silo promptly after the beets are topped. In gathering the tops from the field care should be taken to have them free from dirt, as it

damages the silage. Cut straw should be placed in the bottom of the silo to absorb the excess moisture, and as fast as the tops are cut straw should be mixed with them. In filling the silo special care should be used to have the edges packed firmly. Salt sprinkled over the contents every few inches of depth increases the palatability of the silage. After filling, a 12-inch layer of cut straw should be placed on the top to keep out the air. Other coarse roughage, such as corn or cane stover, can be used in place of the straw. Water should not be added to the silage.

CANE TOPS AND CANE BAGASSE

Tops from sugar cane have been made successfully into silage. The cane tops and leaves should be run through a cutter before they

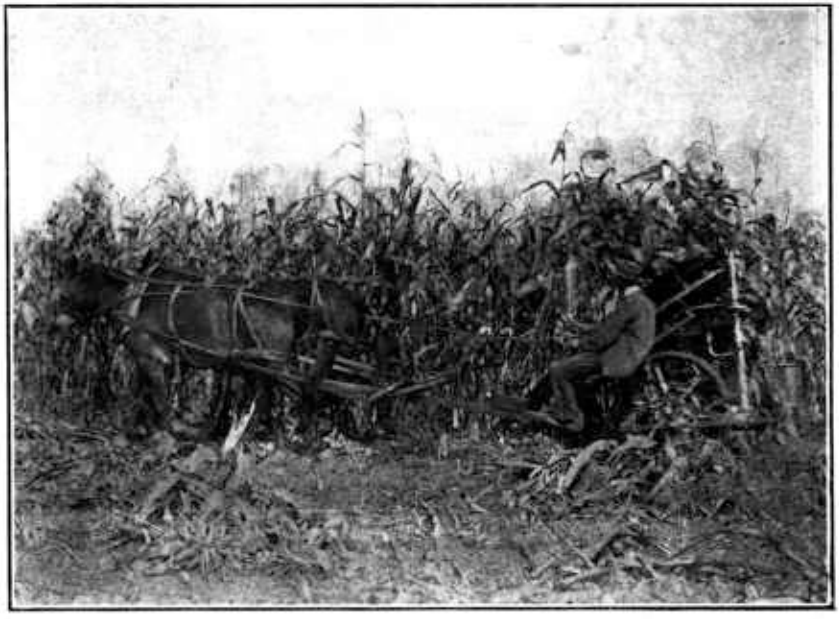

FIG. 3.—A corn harvester at work

are placed in the silo. Such silage, although not so good as corn silage, can well be used in those sections where sugar cane is grown abundantly, thus utilizing what otherwise would be wasted. Cane bagasse or pomace also makes a fair quality of silage.

SUNFLOWERS

Sunflowers are used to some extent in the West and Northwest, where the weather is too cold and the season too short for the best growth of corn. There seems to be a universal agreement among investigators that sunflowers will yield a much greater tonnage than corn in some localities. As high as 29.75 tons to the acre has been reported by the experiment station at Huntley, Mont. At that station it was likewise found that when planted in rows 20 inches apart the sunflowers gave greater yields than when planted farther

apart. The plants were about 10 inches apart in the rows, and 15 pounds of seed were used to the acre. Unless harvested soon after they come into bloom and before the seeds are developed, the silage will be unpalatable. Sunflowers are not so easily handled as corn, on account of their stiff, brittle stalks, and because the heads tend to clog the feeding rolls of the silage cutter.

Opinions differ as to the feeding value of sunflower silage. In some experiments it seems to be practically equal to corn silage; in others it is inferior. Doubtless the stage of maturity at harvesting time of both the sunflowers and the corn has been partly responsible for this lack of uniformity in results. A composite of all experi-

FIG. 4.—The platform cutter is adapted for use where only a small quantity of silage is to be made

ments indicates that sunflower silage is neither so palatable nor so valuable, pound for pound, as corn silage, though it may be fully equal to some of the other kinds of silage.

MISCELLANEOUS CROPS

Beet pulp, apple pomace, Russian thistle, and corn husks from canning factories are also occasionally used for silage, but in general are not so satisfactory as other crops.

HARVESTING THE CROP AND FILLING THE SILO

Corn or sorghums for the silo may be cut by hand, by the one-horse, two-row platform cutter (fig. 4), or by the corn harvester and binder. Hand cutting is practiced on farms where the quantity to be cut is too small to justify the purchase of a harvester and when the corn is down or in such position as to preclude the successful use of

the platform cutter or the corn harvester. Of the three methods the Nebraska experiment station [12] found that although the cost per acre of cutting corn was the lowest when the platform cutter was used, all things considered the corn harvester constituted the most satisfactory method. In case only a small quantity is to be harvested on each farm, several farmers might well cooperate in the purchase of a harvester rather than to do the work by hand.

In using the corn harvester the bundles should be made rather small. While this takes more twine, the extra expense is more than offset by the ease of handling the bundles and feeding them into the silage cutter. The harvester should not get so far ahead of the haulers that the corn will lose any considerable amount of moisture before it reaches the cutter.

A bundle elevator which is attached to the corn harvester in place of the bundle carrier has come into use in the last few years. This elevator delivers the bundles to a wagon driven alongside the harvester. Its use eliminates the hardest part of the silo-filling operation. A load of 2 tons can be put on in 12 to 15 minutes. When

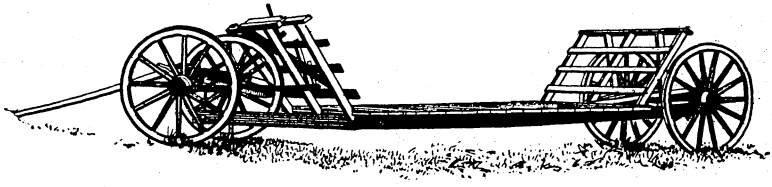

FIG. 5.—A low rack for hauling corn to cutter

the elevator is used the power necessary to pull the harvester is increased, and this fact, together with the need for a steady power, makes the use of a tractor desirable.

HAULING TO THE CUTTER

Ordinarily the corn is hauled to the cutter on a common, flat hayrack. It is best to have this rack mounted on a low-wheeled wagon, even when used in connection with a harvester and elevator. Of course, when the loading is done by hand a low-wheeled wagon is preferable to a high-wheeled one. (Figs. 5 and 6.)

A low rack or body can be made easily. The following directions for making a rack of that kind are taken from Farmers' Bulletin 292, Cost of Filling Silos: [13]

> The rack . . . consists of two 4 by 6 inch bed pieces, 18 or 20 feet in length, bolted together at one end to form a V. On top of these timbers is built a rack 6 feet in width. The bottom of this rack is about 8 feet long. The end boards are 4 feet high, built flaring so they do not quite touch the wheels. The apex of the V is suspended below the front axle of an ordinary farm wagon by means of a long kingbolt. The other ends are attached below the hind axle by U-shaped clevises. . . . The materials needed in its construction are 80 board feet of 4 by 6 inch plank, 96 feet of boards 1 by 12 inches, 22 feet of lumber 2 by 4 inches, 1 long kingbolt, 2 stirrup rods, and bolts and nails.

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[12] CHASE, L. W., and WOOD, I. D. HANDLING SILAGE. Nebr. Agr. Expt. Sta. Bul. 145, 25 p., illus. 1914.

[13] CARRIER, L. COST OF FILLING SILOS. U. S. Dept. Agr. Farmers' Bul. 292, 15 p., illus. 1907.

If few teams are available and the haul is long, the load should be as large as possible. With plenty of teams and a short haul the loads should be smaller, thus saving the labor of high lifting in loading and facilitating the work of unloading.

CUTTING THE SILAGE

A number of satisfactory silage cutters are on the market. The chief features to be considered in a cutter are whether or not it is strongly made and will cut fine. The capacity is important. The mistake is often made of getting one that is too small, thus making the operation of filling the silo very slow and interfering with the continuous employment of the entire force of men. It is better to get a machine large enough so that everyone will be able to keep busy

FIG. 6.—Loading corn on the wagon, the hardest work of all

all the time. The larger cutters are equipped with self-feeders, a labor-saving device which the smaller sizes often lack. Other factors to be taken into account are the amount of work to be done and the power to be used.

The usual length of cutting varies from one-fourth of an inch to 1 inch. The latter is a little too long, as the pieces do not pack so closely in the silo and they are not so completely consumed in feeding as the shorter lengths. On the other hand, the longer the pieces the more rapidly the corn can be run through the cutter. Probably most silage is now cut into pieces about half an inch long.

ELEVATING THE SILAGE

Two types of elevators are in use, the old-style chain carrier and the blower. The chain carrier requires less power but is harder to set up and is not so well adapted for high silos. Some chain carriers are inclosed so as to keep the corn from blowing out. In using the blower type the blower should be as nearly perpendicular as possible (fig. 7) to reduce to the minimum the friction of the cut corn upon the inside of the pipe and thus lessen the danger of clogging.

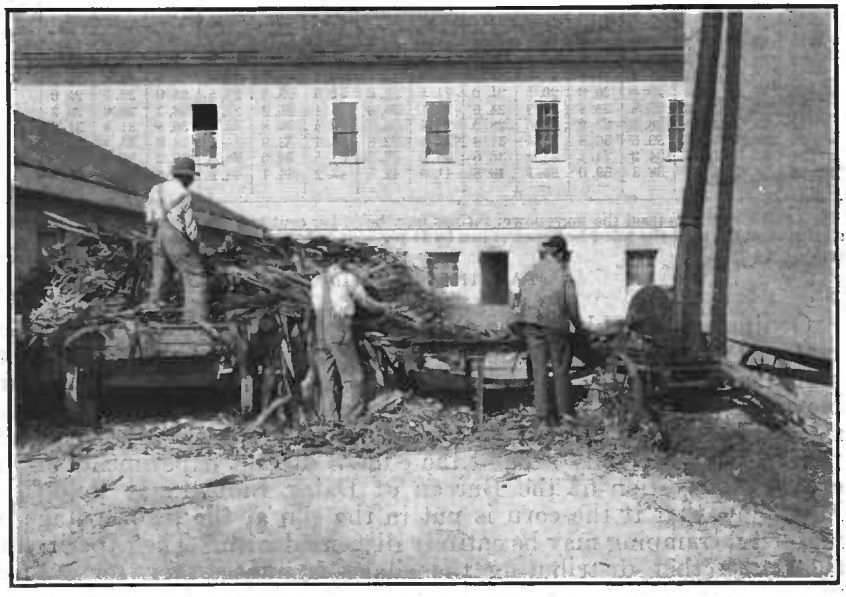

FIG. 7.—Silage cutter with blower

POWER REQUIRED

The power necessary to operate the cutter depends upon width of cutter throat, sharpness of knives, type of elevator, height of silo, rate of feeding, and condition of the corn as regards ears and moisture. Less power is required if the cutter is fed below full capacity. It is advisable to have sufficient power to run the cutter at full capacity, and many prefer to have a little surplus power. The figures in Table 2 represent the minimum power needed to run cutters to full capacity. A smaller engine will necessitate slower feeding, especially with heavy, well-eared corn. This table has been prepared from manufacturers' statements, personal observations, and experience, and is not the result of actual experimental tests.

TABLE 2.—*Horsepower (gas engine) required to operate silage cutter and blower, with varying widths of cutter throat and varying heights of silos*

Width of cutter throat	Height of silo—feet														Approximate capacity
	24	26	28	30	32	34	36	38	40	42	44	46	48	50	
	Horsepower														
															Tons per hour
10	10.5	10.7	10.8	11.0	11.2	11.3	11.4	11.6	11.8	12.0	12.1	12.2	12.4	12.7	
12	13.1	13.3	13.6	13.8	14.0	14.1	14.4	14.6	14.8	15.1	15.2	15.4	15.6	15.9	4
14	15.8	16.1	16.5	16.8	17.1	17.4	17.7	18.1	18.4	18.7	19.1	19.3	19.6	20.2	5
16	18.5	19.0	19.4	20.0	20.5	21.0	21.5	22.0	22.5	23.0	23.5	24.0	24.5	25.0	7
18	21.6	22.2	22.8	23.4	23.9	24.6	25.1	25.8	26.4	26.9	27.4	28.1	28.6	29.3	19
20	25.6	26.1	26.5	27.0	27.6	28.0	28.4	28.9	29.4	29.8	30.3	30.8	31.4	31.8	11
22	28.6	29.7	30.6	30.8	31.4	31.8	32.4	32.8	33.4	33.9	34.4	34.9	35.3	35.8	13
24	33.1	33.6	34.2	34.8	35.4	36.6	36.0	37.2	37.5	38.0	38.5	39.2	39.8	40.3	15
26	36.6	37.3	38.3	39.0	39.7	40.8	41.6	42.3	43.2	44.1	44.9	45.6	46.5	47.3	17
															9

If a steam engine is used the horsepower ratings may be 25 per cent less than the above figures. If an electric motor is used the rated horsepower can be 15 per cent less than the figures in the table.

PACKING THE SILAGE

Ordinarily the blower or carrier empties the cut corn or other material into the top of the silo, where one or more men distribute and tramp it down. Unless the material is distributed the leaves are blown to one side of the silo. The common practice is to keep the sides slightly higher than the center and to tramp the whole surface thoroughly, especially around the edges. Recent experiments at the experiment station of the Bureau of Dairy Industry at Beltsville, Md., show that if the corn is put in the silo at the proper stage of maturity, tramping may be entirely dispensed with. The experiments show also that distributing the silage is unnecessary for perfect preservation. However, in feeding out silage which has not been distributed, it is desirable to take a layer off the entire top of the silage at each feeding, otherwise there is likelihood of getting a batch of silage which contains a preponderance of either leaves or the heavier constituents of the corn plant.

Various contrivances have been used for distributing the cut material, the one commonly recommended being a metal pipe similar to the blower pipe, but put together loosely in sections. The cut corn from the blower passes down the pipe into the silo, and the pipe being flexible (fig. 8) can be swung so as to place the material anywhere in the silo. With this contrivance it is not necessary to handle the material with a fork; one man can easily do the work of two, very little loose material flies about in the silo, and the work is much cleaner. Another advantage is a lessening of the chance that the man in the silo will be struck by some object which might be blown up the blower pipe. As the silage rises in the silo the distributor pipe, which is put together in sections, can be readily shortened.

In going into a partially filled silo early in the morning, before the air has had a chance to circulate, there is danger of encountering poisonous gas. To obviate this condition it is a good plan to run the blower a few minutes before entering the silo.

ADDING WATER

In case the material to be siloed has become too dry, water should be added to supply the deficiency of moisture necessary to make it pack properly. Unless the silage is well packed, air will enter and mold will develop. Enough water should be added to restore the moisture content of the corn to what it would be if cut at the proper stage.

The water may be applied by means of a hose and spray nozzle, directly on the silage in the silo as it is filled; or it may be run into the blower. In the latter way the water is more evenly mixed with the cut material. When very dry fodder is siloed it is probably better to use both methods in order to wet the fodder sufficiently.

Unless the corn is very green it is a good practice to wet the top of the silage thoroughly as soon as the silo is full and has been leveled off. This helps to pack the top layer and to lessen the spoilage.

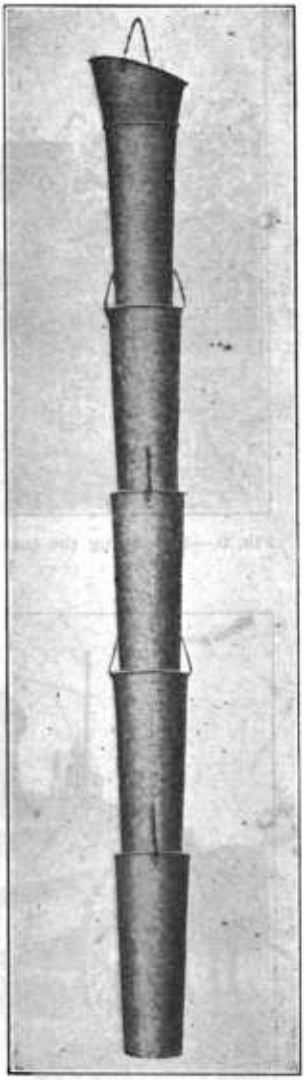

FIG. 8.—Jointed-pipe silage distributor

RONNING METHOD OF MAKING SILAGE

The Ronning method of silo filling has been used to some extent in the last few years. The standing corn is harvested and cut into proper lengths for the silo by a machine drawn by a tractor and operated by means of power from the tractor. (Fig. 9.) The cut corn is delivered to a wagon box drawn alongside. It is then hauled to the silo and pushed off into a blower which elevates it into the silo. (Fig. 10.) With a pit silo the material can be dumped directly into the silo. This method of making silage is the easiest known. It is about as rapid and requires approximately the same size crew as when a harvester and bundle elevator are used. It is easier, however, because the labor of placing the bundles in the wagon is saved and because pushing the cut material into the blower is easier than throwing the corn bundles into the cutter. It is probable also that the Ronning outfit will operate successfully on softer ground than will the harvester and elevator on account of the mechanism being operated by power from the tractor. A disadvantage of the Ronning system is that the corn may be blown down so that hand cutting must be resorted to, in which case the ordinary kind of silage cutter must be used.

COVERING THE SILAGE

Formerly it was a common practice to cover the silage with some material, such as dirt or cut straw, in order to prevent the top layer

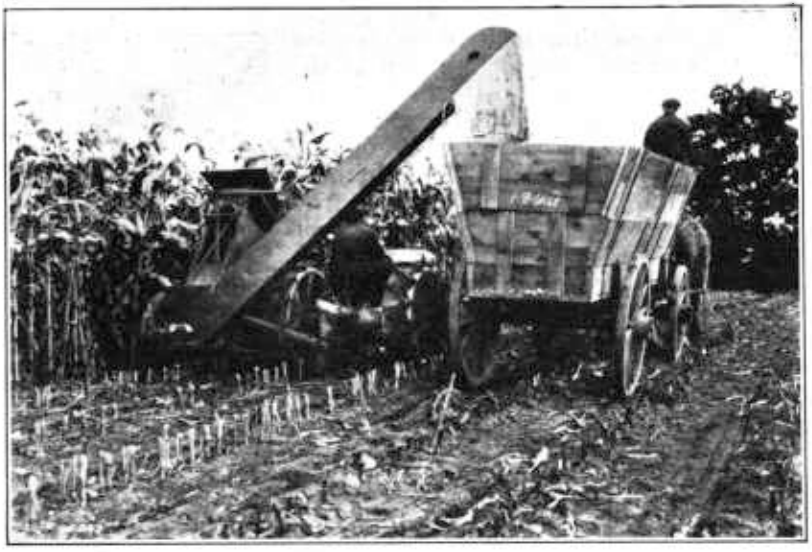

FIG. 9.—Harvesting the corn by the Ronning method. (Courtesy of Central Experiment Farm, Ottawa, Canada)

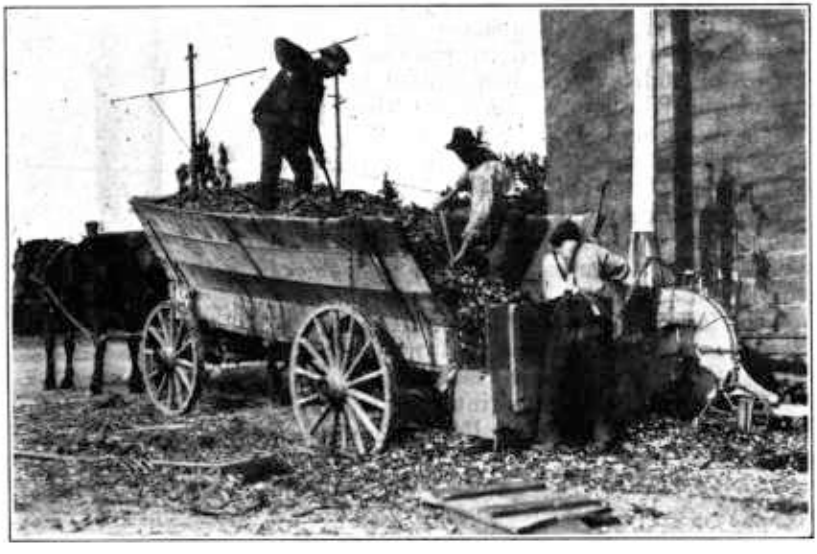

FIG. 10.—Transferring the cut corn to the silo by the Ronning method. (Courtesy of Central Experiment Farm, Ottawa, Canada)

from spoiling. The present means of covering, when any is used, usually consists of a layer of cut corn or sorghum stalks from which the ears or grain have been removed. The heavy green stalks pack

much better and exclude the air more effectually than straw. The top always should be thoroughly tramped and then wetted down. Sometimes oats are sown on the top before wetting. The heat generated by the fermenting mass causes the oats to sprout quickly and form a sod, which serves to keep the air out of the silage beneath. The disadvantage of this method is that the silage spoils before the oats sprout. Whenever possible it is better to begin feeding from the silo as soon as it is filled. If this is done, no covering is necessary and there should be no loss on account of spoiling.

FEEDING VALUE OF SILAGE

COMPOSITION

The chemical composition and the nutritive value of silage vary according to the crop from which it is made, the degree of maturity of the crop, and other factors. (Table 3.)

TABLE 3.—*Average digestible nutrients and net energy value per 100 pounds of silage and other succulent feeds*

(From Feeds and Feeding, by Henry and Morrison) [1]

Crop	Total dry matter	Digestible dry matter			True protein	Net energy value
		Crude protein	Carbohydrates	Fat		
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*	*Therms*
Green-corn fodder	21.9	1.0	12.8	0.4	0.8	14.60
Corn silage	26.3	1.1	15.0	.7	.6	15.90
Green-sorghum fodder	24.9	.7	14.8	.7	.4	15.37
Sorghum silage	22.8	.6	11.6	.5		
Uncured red clover	26.2	2.7	13.0	.6	1.7	15.87
Clover silage	24.4	2.0	9.6	.8	.8	7.26
Uncured soybeans	23.6	3.2	10.2	.5	2.4	12.53
Soy-bean silage	27.2	2.8	10.8	.9	1.5	11.59
Uncured cowpeas	16.3	2.3	8.0	.3	1.7	10.42
Cowpea silage	21.2	1.8	9.7	.5	1.1	11.05
Uncured oats and peas	22.6	2.4	10.6	.6		
Mangels	9.4	.8	6.4	.1	.1	5.68
Sugar beets	16.4	1.2	12.6	.1	.4	11.20
Sugar-beet pulp (wet)	9.3	.5	6.5	.2	.5	8.99
Prickly pear	16.5	.4	8.9	.2		
Sunflower silage	21.9	1.0	9.8	.8		

[1] HENRY, W. A., and MORRISON, F. B. FEEDS AND FEEDING. Ed. 18, unabridged, 770 p., illus. Madison, Wis. 1923.

PALATABILITY

Palatability is of much importance because it induces a large consumption and because it stimulates the secretion of digestive juices. No rough feed is more palatable than good corn silage. Cows nearly always eat silage in preference to hay. If any of the ration is refused it is more often the hay than the silage.

SILAGE FOR DAIRY CATTLE

By T. E. WOODWARD and J. B. MCNULTY

Silage has been found to be particularly well adapted as a feed for dairy cows, and in consequence silos are more numerous on farms devoted to dairying than on any other kind of farms. In many sections silage has come to be the dairy farmer's main reliance for winter feed.

SUPPLEMENTARY FEEDS

Although corn silage is an excellent feed, it is not a complete one for dairy stock. It is too bulky and contains too little protein and mineral matter to meet fully the requirements of the dairy cow. It should be fed along with some leguminous hay, such as clover, soy beans, or alfalfa. These supply the deficiencies of silage in protein and mineral constituents. However, a ration of silage and hay alone is still too bulky to be satisfactory for other than dry cows or those giving a small quantity of milk. Cows can not consume enough of these two feeds to support a liberal flow of milk and maintain their body weight. They must have some concentrated feed.

RATIONS

A good rule to follow in the feeding of silage is to allow each cow about 3 pounds of silage a day for each 100 pounds of live weight. For example, give an 800-pound cow 24 pounds of silage, a 1,200-pound cow 36 pounds of silage, and so on. Along with this give the cow all the hay that she will eat. The quantity of grain to feed depends upon a number of factors, chief of which are quantity and quality of milk yield and kind and quality of hay fed. The quantity of silage stated above and all the good legume hay the cow will eat twice a day will support a milk yield of 10 to 16 pounds, depending upon the richness of the milk. Consequently a cow giving these quantities requires no grain. For the production of milk above these quantities the nutrients must be provided in the grain. About 0.4 pound of grain is required to provide the nutrients for the production of 1 pound of milk testing 3.5 per cent or less butterfat, 0.5 pound for milk of medium richness testing 4 to 4.5 per cent, and about 0.6 pound for milk testing more than 5 per cent. For example, if a cow is giving 25 pounds of milk testing more than 5 per cent, 10 pounds of this will be provided for by the roughage, whereas 15 pounds must be provided for by the grain. The quantity of grain needed, therefore, is 15×0.6 pound, or 9 pounds. If a cow is giving 36 pounds of milk testing 3.5 per cent or less, 20 pounds must be provided for by the grain. The quantity of grain needed for this cow, therefore, is 20×0.4 pound, or 8 pounds. Coarse or poorly cured legume hay or grass hay is not consumed in such great quantities as good legume hay. Consequently when such hay is fed the grain allowance must be increased.

TIME TO FEED

Although good corn silage has no pronounced effect on the flavor and odor of milk, it is probably best to feed it either just after milking or several hours before milking, to avoid tainting the milk.[14] Silage is usually fed twice a day.

RATE OF FEEDING

When silage is exposed to the air in warm weather it spoils quickly. For this reason a uniform layer should be removed from the top every

[14] GAMBLE, J. A., and KELLY, E. THE EFFECT OF SILAGE ON THE FLAVOR AND ODOR OF MILK. U. S. Dept. Agr. Bul. 1097, 24 p., illus. 1922.

day. In summer this layer should be not less than 3 inches thick but during cold weather feeding may be as slow as desired. Except for some drying on the surface, silage from which the top had been fed has been known to keep in perfect condition for a month or longer in winter.

As a means of preventing loss from surface spoilage the Missouri Agricultural Experiment Station uses and recommends a canvas covering, treated with hot paraffin to make it air-tight, which is stretched tightly over the silage to within half an inch of the walls upon a circular iron frame. By means of a pulley and rope the canvas can be raised or lowered.

FEEDING FROZEN SILAGE

Frozen silage must be thawed before using, after which it should be fed immediately, before decomposition sets in. No harm will result from feeding such silage, nor is the nutritive value known to be changed in any way.

SILAGE FOR CALVES, BULLS, AND DRY COWS

Although silage has been fed successfully to vigorous young calves as soon as they would eat it and in as large quantities as they would consume, there is some evidence that it should be omitted from the ration until the danger of serious digestive disturbance is past, say 60 days, after which it may be fed safely in quantities up to the capacity of the calf. Yearling heifers consume about half as much as mature stock, that is, from 12 to 24 pounds a day if they are well grown. When supplemented with some good leguminous hay, little grain is required to keep the yearlings in a thrifty, growing condition.

An opinion is held by some breeders of dairy stock that a large allowance of silage is detrimental to the breeding qualities of the bull. Whether there is scientific foundation for this opinion remains to be determined. Probably it is a good plan to limit the allowance to about 12 pounds a day for each 1,000 pounds of live weight. When fed in this quantity, silage is thought to be a good, cheap, and safe feed for bulls. It should be supplemented with hay, of course, and with grain also, especially in the case of bulls doing active service or growing rapidly.

When cows are dry they consume almost as much roughage as when they are producing milk. Silage may well form the principal ingredient of their ration; in fact, with from 25 to 40 pounds of silage and from 5 to 8 pounds a day of clover, soy bean, or alfalfa hay—the cows will keep in good flesh and even gain in weight. Dry cows in thin flesh should always receive some grain. Silage tends to keep the whole system of the cow in good condition and in this way lessens the difficulties of calving.

SILAGE FOR SUMMER FEEDING

One of the most trying seasons of the year for dairy cows is the latter part of summer and early in the fall. At this season the pastures are often short or dried up, and it is a common mistake of dairymen to let their cows decrease in milk flow because of the shortage of feed. Later in the fall it is impossible to restore the

milk flow, no matter how well the cows are fed. On good dairy farms the milk flow of the cows is maintained at as high a level as possible, from parturition to drying off. It becomes necessary, therefore, to supply some feed in addition to pasture grass. The easiest way to do this is to feed silage, which is cheaper and decidedly more convenient to use than soiling crops. How much to feed depends on the condition of the pastures, the quantity varying all the way from 10 pounds to a full winter feed.

SILAGE FOR HORSES AND MULES.

By GEORGE M. ROMMEL (Revised by J. O. Williams, of the Animal Husbandry Division)

Silage is not generally used in horse and mule feeding, but it is a safe feed for either horses or mules if it is of good quality and is carefully fed.

Both horses and mules are peculiarly susceptible to the effects of molds, and under certain conditions varieties of molds are found in silage which are deadly poisons to both of these classes of stock. Such molds are the result of either the improper cutting or packing of the silage, or both. Molds must have air to grow. Silage which is packed air-tight and fed out rapidly will not become moldy. If the feeder watches the silage carefully as the weather becomes warm, he can soon detect the presence of mold. When mold appears, the feeding should be stopped immediately. Similarly, care should be exercised in the winter feeding of silage so that horses or mules are not allowed to eat frozen silage, because of the danger of colic.

Corn silage is the only kind that so far has met with any degree of favor as a horse or mule feed. Corn which is to be ensiled for this purpose should not be cut too green, as sour silage will result, and this may cause colic when fed. Corn for such feed, rather, should be cut when it has begun to glaze, and the silo, once the ensiling process has been started, should be filled as rapidly as possible. When filling the silo it is essential that the corn be carefully and thoroughly tramped and packed. This is one of the most important points in the feeding of silage to horses and mules. Cutting the silage fine and in lengths of less than 1 inch will facilitate packing. If tramping and packing are properly done, no feeding danger is likely to result, but if these operations are slighted, air pockets may form and cause the accumulation of small masses of mold. Such mold, if overlooked in feeding, may be sufficient to kill one or more of the animals fed.

Silage should not be considered as the principal roughage for horses and mules, but should serve as a partial substitute for hay in the daily ration. Because of its bulky nature, horses and mules doing hard work should not be fed large quantities, but, due to its tonic, laxative, and appetizing effects, it is well suited for the maintenance of idle horses and mules, brood mares, and growing stock. The value of silage is greatest, in the case of horses and mules, as a means to carry them through the winter cheaply or to supplement pasture during periods of drought. When used, silage should be introduced gradually into the ration, and the amount fed should generally not exceed 10 to 15 pounds daily per animal.

SILAGE FOR BEEF CATTLE

By E. W. SHEETS

SILAGE FOR THE BREEDING HERD

Silage, when available, should form the principal part of the winter ration for the breeding herd. (Fig. 11.) Cows and calves relish it and thrive upon it when some supplement is added. Silage in the ration creates an appetite for less palatable and cheaper roughages, thus reducing the cost of wintering. As a rule, good legume hays should be fed to the cows suckling calves, unless a protein concentrate such as cottonseed meal or linseed meal is fed with the other roughages. It may also be advisable to feed 2 or 3 pounds of grain in addition, especially if the cows are milking heavily and are somewhat thin in flesh.

The following rations are well adapted to wintering 1,000-pound cows under average conditions and should more than maintain the weight of the cattle

Feeds fed	Average daily amount of feed			
	Ration 1	Ration 2	Ration 3	Ration 4
	Pounds	*Pounds*	*Pounds*	*Pounds*
Silage	25 to 30	25 to 30	25 to 30	35 to 40
Legume hay (clover, alfalfa, etc.)	6 to 8			
Nonlegume hay (grass hays, also stover)		6 to 8		
Cereal straw (oat, wheat, rye, etc.)	2 to 4	2 to 4	8 to 10	
Protein concentrate (linseed meal, cottonseed meal, etc.)		½ to 1	1 to 2	1½ to 2½

For dry cows, silage and cheap roughage, such as coarse hays and stover, may be used almost exclusively, thus greatly reducing the cost of wintering. The amount or even the kinds of roughages and other feed in addition to silage will be determined largely by the quality of the silage. If there is little mature corn in the silage, or if the mature corn was removed before filling the silo, it is necessary to feed more silage or to supplement it with other or more nutritious feeds.

Generally good results are obtained in feeding breeding bulls half as much silage as is given to cows. A small amount of grain should be supplied in addition to the silage, depending upon the condition of the animal, the exercise or service given, and the nature of other roughages fed.

SILAGE FOR GROWING CALVES

Calves should be fed silage only in limited quantities before they are weaned. Silage is especially relished by calves just weaned. They take to it more quickly than to dry feed and lose but little weight during the weaning period when they are liberally fed on grain, legume hay, and silage. After they are weaned the amount of silage as well as other feeds should be determined by the use to be made of the calf. If kept for breeding purposes or for finishing at an early age, they should have a more liberal allowance of grain and legume hay.

TABLE 4.—*The following rations will keep a calf weighing from 400 to 600 pounds in a thrifty, growing condition and allow considerable gain during the winter*

Feeds fed	Average daily amount of feed			
	Ration 1	Ration 2	Ration 3	Ration 4
	Pounds	*Pounds*	*Pounds*	*Pounds*
Silage	15 to 20	15 to 20	15 to 20	20 to 25
Legume hay (clover, alfalfa, etc.)	2 to 5			
Nonlegume hay (grass hays, also stover)		4 to 6		
Cereal straw (oat, wheat, etc.)			4 to 6	
Protein concentrates (linseed meal, cottonseed meal, etc.)		¼ to ½	½ to 1	¾ to 1½

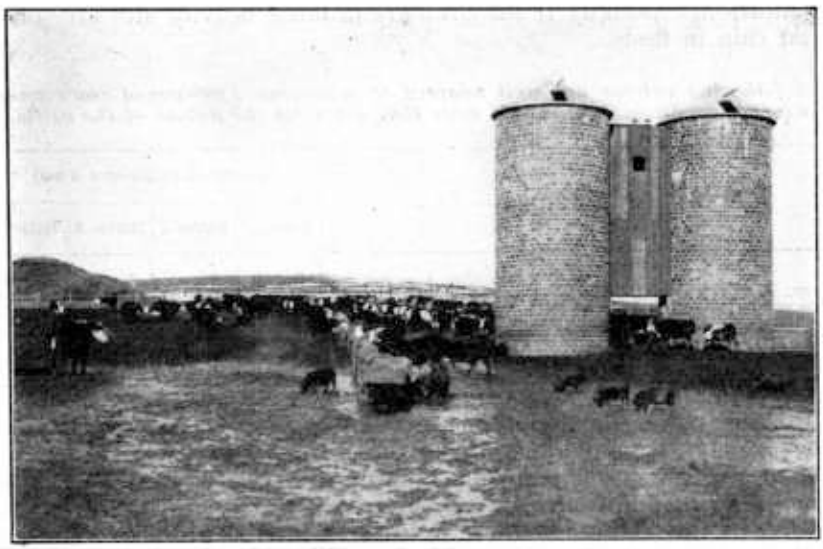

FIG. 11.—Silage is one of the best roughages for wintering the beef breeding herd

SILAGE FOR WINTERING STOCKERS

While silage is undoubtedly one of the best feeds for wintering stockers or feeders of all ages, nevertheless one must keep in mind the fact that they make better use of the dry, coarse, cheap roughages produced on the farm than do cows, giving milk, or growing calves. For that reason it is frequently advisable to limit the silage fed to the stockers and give them more of the less desirable feeds. Some, however, withhold silage altogether, which is a great mistake. If it should be found desirable to remove the more mature ears from the corn before filling the silo, stockers will utilize such silage to better advantage than other cattle except, possibly, dry cows. When such silage is used it should be fed more liberally than when no ears have been removed.

In the grazing areas the cost of the winter rations has been found to be approximately two-thirds the feed cost for the year. It is de-

sirable that stockers make some gain during the winter if they are to make the maximum gain for the year. From the standpoint of economy in the ration, silage can hardly be replaced by any other feed for this purpose.

If hay or other dry roughages are scarce and high in price, it may be advisable to limit the dry roughage to a few pounds and increase the amount of silage, supplying in addition a protein concentrate, such as cottonseed meal, linseed meal, or velvet beans.

TABLE 5.—*The following rations will usually be found satisfactory for wintering stockers or feeders weighing from 600 to 800 pounds, and should more than maintain the weight of the animals*

Feeds fed	Average daily amount of feed			
	Ration 1	Ration 2	Ration 3	Ration 4
	Pounds	*Pounds*	*Pounds*	*Pounds*
Silage	20 to 25	20 to 25	20 to 25	25 to 35
Legume hay (clover, alfalfa, etc.)	3 to 4			
Nonlegume hay (grass hays, also stover)		3 to 4		
Cereal straw (oat, wheat, etc.)	2 to 4	2 to 4	6 to 8	
Protein concentrate (cottonseed meal, linseed meal, etc.)		½ to 1	½ to 1	1 to 2

The rations suggested for yearlings are also adapted for feeding older cattle. The amount of silage should be increased 5 to 10 pounds for 2-year-old cattle and 10 to 15 pounds for older cattle, depending upon their size and condition as well as the quality of silage fed. The dry roughages should also be increased accordingly from 2 to 3 pounds for each year of increase in age or proportionate size.

SILAGE FOR FATTENING CATTLE

The use of silage in rations for fattening cattle varies considerably throughout the steer-feeding sections and is governed primarily by other kinds of roughage grown within the areas. In those localities where alfalfa and clover hay are produced abundantly, the use of silage for fattening beef cattle is rather limited, whereas in other areas producing grass hays or mixed hay largely silage is more extensively used. Ordinarily an abundance of cheap, dry roughage lessens the use of silage. The market value of grain also is a determining factor affecting the use of silage. When corn and other grains are high priced, their use in the ration is usually limited and the quantity of silage and protein concentrates is increased.

Experiments have shown that a certain amount of dry roughage should be fed in silage rations. Silage rations usually necessitate a longer feeding period.

TABLE 6.—*For 1,000-pound fattening animals the following average rations should be found satisfactory*

Feeds fed	Average daily amount of feed [1]				
	Ration 1	Ration 2	Ration 3	Ration 4	Ration 5
	Pounds	*Pounds*	*Pounds*	*Pounds*	*Pounds*
Silage	25 to 30	25 to 30	30 to 35	30 to 35	45 to 50
Legume hay (clover, alfalfa, etc.)	1 to 2	6 to 8			1½ to 2
Nonlegume hay (grass hay, also stover)			4 to 6	6 to 8	
Protein concentrate,[2] (cottonseed meal, linseed meal, etc.)	2 to 3		3 to 4	4 to 6	2½ to 3
Corn (shelled or broken ear)	12 to 14	14 to 15	8 to 10		

[1] The amount of the different feeds given is the average to be fed during the entire feeding period. It will be necessary to use smaller amounts at the beginning and increase the feeds gradually until the cattle are on full feed. As feeding progresses the silage and other roughages are gradually reduced and the concentrates increased.

[2] Where velvet beans (in pods) are used, 2½ pounds will be found approximately equivalent to 1 pound of cottonseed meal.

It should be understood that the rations given are not necessarily to be fed in the exact amounts stated but should be modified to suit local conditions and the feeds available on each farm as well as the prices of the different feeds. It may be found desirable in many sections of the South to substitute cottonseed hulls for nonlegume hays or even for legume hay when the price for the hulls would make such a purchase advisable.

SILAGE FOR SHEEP

By F. R. MARSHALL (Revised by D. A. Spencer, of the Animal Husbandry Division)

The use of silage in the winter ration of the flock is increasing. Heretofore many sheepmen have been prejudiced against the use of silage, claiming that it caused abortion and losses of breeding stock. It has been proved by different experiment stations in tests with both breeding and feeder lambs that good silage is an economical as well as valuable part of the ration. Where moldy, decomposed, or too acid silage is fed losses occur, but judicious feeding of good-quality silage improves the health and vitality of the flock.

SILAGE FOR THE BREEDING FLOCK

No cheaper or better roughage can be fed the breeding flock than good corn silage, which furnishes the succulence so necessary for the maintenance of the health and vitality of the ewes.

A good quality of silage is very palatable, and quantities ranging from 1 to 5 pounds per head per day have been fed in different feeding trials with good results. The quantity to be fed depends on the class of sheep and the character of the other feeds comprising the ration. As a rule, however, not more than 4 pounds of silage per head per day should be fed, and some hay always should be in the ration.

Silage shows the best results when fed with a good legume hay. The following has been found to be a good ration for the breeding ewe:

	Pounds
Corn silage	3 to 4
Clover or alfalfa hay	2 to 3

Toward the end of the period of pregnancy it would be well to add about one-half to 1 pound of grain to the ewe's ration, thus insuring a strong lamb. If the silage contains a fairly large quantity of grain, however, this increase may not be necessary. If the ewes are in extra good condition at the beginning of winter and do not lamb until the pasture season opens, grain may be dispensed with. Usually earlier lambing and the use of some grain are found to be more profitable, in the latitude of the Corn Belt and the South.

SILAGE FOR LAMBS

In fattening lambs, corn silage not only saves hay and grain but reduces the cost of grains.

Care must be exercised in starting lambs on silage. If too much is given at the beginning of the feeding period, the lambs will probably go off feed and scour. To prevent this, offer a small quantity at the start and gradually increase the daily allowance until they are on full feed. Lambs weighing from 50 to 60 pounds should consume about 1.5 pounds of silage per head per day when receiving grain, and hay in addition. Larger quantities of silage can be fed, but some protein supplement, such as linseed or cottonseed cake, should be added to balance the ration.

A fattening ration for lambs that gave excellent results at the Indiana experiment station is as follows:

	Pounds
Grain (shelled corn, 4 parts, cottonseed meal, 1 part)	1.1
Corn silage	1.38
Clover hay	1.11

In wintering ewe lambs, silage should form an important part of the ration, and when fed in conjunction with a good legume hay it not only keeps the lambs in good condition but furnishes a good growing ration.

ORGANIZATION OF THE UNITED STATES DEPARTMENT OF AGRICULTURE

November 28, 1928

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